Dear student following is an Easy level [● ○ ○] test paper. Score of 24 Marks in 15 Minutes would be a satisfactory performance. Questions 1-10(+3,–1). (All questions have only one option correct).

Q.1 If f(x) is continuous function and attains only rational values if f(0) = 3. Then the real roots of the equation $f(1)\,x^2 + 2f(2)x + f(3) = 0$ are-
(A) 1 (B) 2 (C) 0 (D) None

Q.2 If roots of the equation $x^2 + ax + b = 0$ are c and d then one of the roots of the equation $x^2 + (2c + a)x + c^2 + ac + b = 0$ is-
(A) c (B) d – c (C) 2c (D) 2d

Q.3 The number of values of a for which $(a^2 - 3a + 2)\,x^2 + (a^2 - 5a + 6)x + a^2 - 4 = 0$ is an identity in x is-
(A) 1 (B) 2 (C) 3 (D) 0

Q.4 If all real values of x obtained from the equation $4^x - (a - 3)2^x + a - 4 = 0$ are non positive, then-
(A) $a \in (4, 5]$ (B) $a \in (0, 4)$
(C) $a \in (4, \infty)$ (D) None of these

Q.5 If one root of equation $(\ell - m)x^2 + \ell x + 1 = 0$ be double of the other and if ℓ be real, then-

(A) $m < \frac{9}{8}$ (B) $m \le \frac{9}{8}$

(C) $m > \frac{8}{9}$ (D) $m \ge \frac{8}{9}$

Q.6 If the roots of the equation $ax^2 + cx + c = 0$ be in the ratio p : q, then $\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} + \sqrt{\frac{c}{a}} =$
(A) 1 (B) 0 (C) –1 (D) None

Q.7 If roots of the equation $x^2 + px + q = 0$ differ from the roots of the equation $x^2 + qx + p = 0$ by the same quantity, then-
(A) q – p + 4 = 0 (B) – p – q + 4 = 0
(C) p + q + 4 = 0 (D) p + q – 4 = 0

Q.8 If α, β be the values of x obtained from the equation $m^2(x^2 - x) + 2mx + 3 = 0$ and if m_1 and m_2 be the two values of m for which α and β are connected by the relation $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{4}{3}$. Then $\frac{m_1^2}{m_2} + \frac{m_2^2}{m_1} =$

(A) $-\frac{68}{3}$ (B) $\frac{68}{3}$ (C) $\frac{3}{68}$ (D) $-\frac{3}{68}$

Q.9 The roots of the equation $(q - r)x^2 + (r - p)x + p - q = 0$ are-

(A) $\frac{r-p}{q-r}, 1$ (B) $\frac{p-q}{q-r}, 1$

(C) $\frac{q-r}{p-q}, 1$ (D) $\frac{r-p}{p-q}, 1$

Q.10 The solution set of $|x^2 + x| = x^2 + x$ is ....
(A) $(-\infty, -1)$ (B) $[0, \infty)$
(C) $[-1, 0]$ (D) $(-\infty, -1] \cup [0, \infty)$

MATHEMATICS IIT JEE (JULY 3rd WEEK CLASS TEST 5) (QUADRATIC EQUATION) ANSWER KEY

Name : ..... **Roll No. :** .....

	A	B	C	D		A	B	C	D		A	B	C	D
1	○	○	○	○	4	○	○	○	○	7	○	○	○	○
2	○	○	○	○	5	○	○	○	○	8	○	○	○	○
3	○	○	○	○	6	○	○	○	○	9	○	○	○	○
										10	○	○	○	○

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	A	B	A	A	B	B	C	A	B	D

SOLUTIONS

Sol.1 (A)

f(x) is continuous function and attain only rational values

$\Rightarrow$ f(x) = constant

$\Rightarrow$ f(x) = 3

Hence given equation is $3(x^2 + 2x + 1) = 0$

$\Rightarrow$ x = – 1 is the only solution.

Sol.2 (B)

Let $f(x) = x^2 + ax + b$, then

$x^2 + (2c + a)x + c^2 + ac + b = f(x + c)$

Thus roots of f(x + c) = 0 will be 0, d – c.

Sol.3 (A)

The given quadratic equation is an identity in x iff

$a^2 - 3a + 2 = 0$, $a^2 - 5a + 6 = 0$, $a^2 - 4 = 0$

$\Rightarrow$ (a – 2) (a – 1) = 0, (a – 2) (a – 3) = 0, (a – 2) (a + 2) = 0

$\Rightarrow$ a = 2, 1, a = 2, 3, a = 2, – 2

$\Rightarrow$ a = 2

Sol.4 (A)

Given equation can be written as

$(2^x)^2 - (a - 4)\,2^x - 2^x + a - 4 = 0$

$\Rightarrow$ $(2^x - 1)(2^x - a + 4) = 0$

$\Rightarrow$ $2^x = 1,\ 2^x = a - 4$

$\because$ x is non-positive

$\Rightarrow$ $x \le 0$

$\Rightarrow$ $2^x \le 1$

$\Rightarrow$ $0 < a - 4 \le 1$

$\Rightarrow$ $4 < a \le 5$

Sol.5 (B)

Let the roots of the equation $(\ell - m)x^2 + \ell x + 1 = 0$ are α and 2α.

$$\Rightarrow \quad \alpha + 2\alpha = -\frac{\ell}{\ell - m} \qquad \text{..... (1)}$$

$$\text{and } (\alpha)(2\alpha) = \frac{1}{\ell - m} \qquad \text{..... (2)}$$

Eliminating α from (1) & (2) we have

$$2\left(\frac{-\ell}{\ell - m}\right)^2 = \frac{1}{\ell - m}$$

$$\Rightarrow \quad \frac{2\ell^2}{9(\ell - m)} = 1 \qquad \because \quad \ell \ne m$$

$$\Rightarrow \quad 2\ell^2 - 9\ell + 9m = 0$$

Given ℓ is real $\Rightarrow$ $D \ge 0$

$\therefore$ $9^2 - 72m \ge 0$

$$\Rightarrow \quad m \le \frac{9}{8}$$

Sol.6 (B)

Let the roots of the equation $ax^2 + cx + c = 0$ be α and β.

$$\Rightarrow \quad \alpha + \beta = -\frac{c}{a} \text{ and } \alpha\beta = \frac{c}{a}$$

$$\text{Given } \frac{\alpha}{\beta} = \frac{p}{q}$$

$$\therefore \quad \sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} + \sqrt{\frac{c}{a}}$$

$$= \sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{c}{a}}$$

$$= \frac{\alpha + \beta}{\sqrt{\alpha\beta}} + \sqrt{\frac{c}{a}}$$

$$= -\frac{c/a}{\sqrt{c/a}} + \sqrt{\frac{c}{a}} = -\sqrt{\frac{c}{a}} + \sqrt{\frac{c}{a}}$$

$$= 0$$

Sol.7 (C)

Let α, β be the roots of $x^2 + px + q = 0$ and γ, δ be the roots of $x^2 + qx + p = 0$

$\therefore$ $\alpha + \beta = -p$ and $\alpha\beta = q$

and $\gamma + \delta = -q$ and $\gamma\delta = p$

Now from question $\alpha - \gamma = \beta - \delta$

or $(\alpha - \beta) = (\gamma - \delta)$

or $(\alpha - \beta)^2 = (\gamma - \delta)^2$

or $(\alpha + \beta)^2 - 4\alpha\beta = (\gamma + \delta)^2 - 4\gamma\delta$

or $p^2 - 4q = q^2 - 4p$

or $p^2 - q^2 + 4(p - q) = 0$

$(p - q)[p + q + 4] = 0$

$\because$ $p - q \ne 0$ $\Rightarrow$ $p + q + 4 = 0$

Sol.8 (A)

α, β are roots of the equation $m^2x^2 + (2m - m^2)x + 3 = 0$

$$\Rightarrow \quad \alpha + \beta = \frac{-2m + m^2}{m^2}, \ \alpha\beta = \frac{3}{m^2}$$

given $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{4}{3}$

$$\Rightarrow \quad \frac{\alpha^2 + \beta^2}{\alpha\beta} = \frac{4}{3}$$

$$\Rightarrow \quad \frac{(\alpha + \beta)^2 - 2\alpha\beta}{\alpha\beta} = \frac{4}{3}$$

$$\Rightarrow \quad 3(\alpha + \beta)^2 - 6\alpha\beta = 4\alpha\beta$$

$$\Rightarrow \quad 3(\alpha + \beta)^2 - 10\alpha\beta = 0$$

$$\Rightarrow \quad 3\left[\left(\frac{-2m + m^2}{m^2}\right)^2 - 10.\frac{1}{m^2}\right] = 0$$

$$\Rightarrow \quad 3[m^2 + 4 - 4m - 10] = 0$$

$$\Rightarrow \quad m^2 - 4m - 6 = 0$$

Given m_1 and m_2 are two values of m

$\therefore \quad m_1 + m_2 = 4$ and $m_1 m_2 = -6$

Now $\frac{m_1^2}{m_2} + \frac{m_2^2}{m_1}$

$$= \frac{m_1^3 + m_2^3}{m_1 m_2}$$

$$= \frac{(m_1 + m_2)^3 - 3m_1m_2(m_1 + m_2)}{m_1 m_2}$$

$$= \frac{(4)^3 + 3 \times 6 \times 4}{(-6)}$$

$$= -\frac{68}{3}$$

Sol.9 (B)

Here sum of the coefficients of the quadratic equation = q − r + r − p + p − q = 0

$\therefore$ 1 is a root of the given quadratic equation

Let β be the other root of the given equation

Now product of roots, $1.\beta = \frac{p - q}{q - r}$

$$\Rightarrow \quad \beta = \frac{p - q}{q - r}$$

Hence roots of the given equation are 1 and $\frac{p - q}{q - r}$.

Sol.10 (D)

$|x^2 + x| = x^2 + x$ gives

$x^2 + x \geq 0$ [$\because$ $|x| = x$ if $x \geq 0$]

$\Rightarrow$ $x(x + 1) \geq 0$

$\Rightarrow$ $x \geq 0, x \geq -1$ or $x \leq 0, x \leq -1$

$\Rightarrow$ $x \geq 0$ or $x \leq -1$

$\Rightarrow$ $x \in [0, \infty)$ or $x \in (-\infty, -1]$

$\therefore$ sol. set is $(-\infty, -1] \cup [0, \infty)$